

Claims:

1. An information management system comprising a plurality of nodes connected to each other via a network, wherein each of the plurality of nodes comprises:

a storage for storing information to be shared among
5 the plurality of nodes; and

an update manager for managing an update of the information using an updated minimum unit of the information, the updated minimum unit including an updated portion of the information.

10 2. The information management system according to claim 1, wherein, when an update occurs at the node, the update manager transmits an updated minimum unit of the information to another node.

3. The information management system according to
15 claim 1, wherein, when an update occurs at the node, the update manager transmits update information to another node, the update information including identification information identifying an updated minimum unit of the information.

4. The information management system according to
20 claim 2, wherein, when receiving an updated minimum unit of the

information from another node, the update manager updates a corresponding minimum unit of the information stored in the storage using the updated minimum unit received.

5. The information management system according to
5 claim 1, wherein the information comprises a plurality of elements which are hierarchically structured, wherein a minimum element including the updated portion of the information is determined as the updated minimum unit.

6. The information management system according to
10 claim 1, wherein the update manager manages the update of the information using an update time at which the update of the information occurs,

wherein, when an update occurs at the node, the update manager transmits update information to another node,
15 the update information including the update time.

7. The information management system according to claim 6, wherein, when receiving the update information from another node, the update manager updates the information stored in the storage based on the update information received.

20 8. The information management system according to claim 7, wherein
the update manager determines whether the update

time of the update information received is later than an updated time of the information currently stored in the storage, and

when the update time of the update information received is later than an updated time of the information currently stored in the storage, the update manager requests transfer of an updated minimum unit of the information.

9. The information management system according to claim 1, wherein, when an update occurs at the node, the update manager transmits an updated minimum unit of the information to another node at a plurality of predetermined times.

10. The information management system according to claim 1, wherein, when an update occurs at the node, the update manager transmits update information to another node at a plurality of predetermined times, the update information including identification information identifying an updated minimum unit of the information.

11. The information management system according to claim 10, wherein the update manager manages the update of the information using an update time at which the update of the information occurs, the update information further includes the update time.

12. The information management system according to

claim 3, further comprising a control node for controlling communications between the nodes on the network,

the control node comprising:

an information manager for managing the information
5 stored in the storage for each of the nodes;

an update information receiver for receiving an update information from a first node at which an update of the information occurs; and

an update controller for transmitting the update
10 information received from a first node to a second node.

13. The information management system according to claim 12, wherein the update controller of the control node transmits the update information received from the first node to the second node at a plurality of predetermined times.

15 14. The information management system according to claim 12, wherein, when the second node receives the update information from the control node, the update manager of the second node updates the information stored in the storage based on the update information received.

20 15. The information management system according to claim 14, wherein, in the second node,
the update manager determines whether the update time of the update information received is later than an updated

time of the information currently stored in the storage, and
when the update time of the update information
received is later than an updated time of the information
currently stored in the storage, the update manager uses the
5 identification information to request transfer of an updated
minimum unit of the information from the control node.

16. The information management system according to
claim 6, further comprising a control node for controlling
communications between the nodes on the network,

10 the control node comprising:

an information storage for storing the information
stored in the storage of each of the nodes;

an information manager for managing the information
for each of the nodes and an update time thereof;

15 a update information receiver for receiving an
update information from a first node at which an update of the
information occurs; and

an update controller for

selecting a second node having the update time of the
20 information stored therein, which is later than the update time
included in the update information received from the first node,
and

transmitting the updated minimum unit of the information
identified by the identification information included in the
25 update information received from the first node, to the second

node.

17. A structured document processing system comprising a network composed of a server device and a plurality of client devices, the server device storing a structured document composed of a plurality of elements which are hierarchically structured, each of the elements being a constituent unit of the structured document, and each of the client devices storing a duplication of the structured document,

the server device comprising:

an update manager for managing an update of the structured document using an updated minimum element of the structured document, the updated minimum element including an updated portion of the structured document.

18. The structured document processing system according to claim 17, wherein the server device further comprises a transmission section, the update manager instructing the transmission section to transmit an updated minimum element of the structured document to a client device when the structured document has been updated.

19. The structured document processing system according to claim 17, wherein the server device further comprises a transmission section, the update manager instructing the transmission section to transmit update information to a

client device when the structured document has been updated, the update information including identification information identifying an updated minimum element of the structured document.

5 20. The structured document processing system according to claim 17, wherein the update manager manages the update of the structured document using an update time at which the update of the structured document occurs,

 wherein, when an update occurs at the node, the
10 update manager instructing the transmission section to transmit update information to a client device, the update information including the update time.

 21. The structured document processing system according to claim 20, wherein, when a client device receives
15 the update information from the server device, the client device updates the structured document stored therein based on the update information received.

 22. The structured document processing system according to claim 21, wherein each of the client devices
20 comprises:

 a comparator for comparing the update time of the update information received is later than an updated time of the structured document currently stored therein; and

a transmission controller for requesting transfer of an updated minimum element of the structured document when the update time of the update information received is later than the updated time of the structured document currently stored
5 therein.

23. The structured document processing system according to claim 17, wherein the update manager transmits an updated minimum element of the structured document to a client device at a plurality of predetermined times.

10 24. The structured document processing system according to claim 17, wherein the update manager transmits update information to the client device at a plurality of predetermined times, the update information including identification information identifying an updated minimum
15 element of the structured document.

25. The structured document processing system according to claim 24, wherein the update manager manages the update of the structured document using an update time at which the update of the structured document occurs, the update
20 information further includes the update time.

26. The structured document processing system according to claim 17, further comprising:

a gateway server device performing protocol processing between the server device and each of the client devices,

wherein the server device transmits update
5 information indicating that the structured document is updated to the gateway server device,

wherein the gateway server device comprises:

an structured document manager for managing the duplication of the structured document stored in the client
10 device;

an update information receiver for receiving update information from the server device; and

an update controller for transmitting the update information received from the server device to the client device.

15 27. The structured document processing system according to claim 26, wherein the update controller transmits the update information received from the server device to the client device at a plurality of predetermined times.

20 28. The structured document processing system according to claim 26, wherein, when a client device receives the update information from the gateway server device, the client device updates the duplication of the structured document stored therein based on the update information received.

29. The structured document processing system according to claim 28, wherein each of the client devices comprises:

5 a comparator for comparing the update time of the update information received is later than an updated time of the structured document currently stored therein; and

a transmission controller for requesting transfer of an updated minimum element of the structured document when the update time of the update information received is later than
10 the updated time of the structured document currently stored therein.

30. The structured document processing system according to claim 17, further comprising:

a gateway server device performing protocol
15 processing between the server device and each of the client devices,

wherein the server device transmits update information including an update time and the updated minimum element to the gateway server device,

20 wherein the gateway server device comprises:

an structured document storage for storing the duplication of the structured document stored in the client device;

an structured document manager for managing the
25 duplication of the structured document for the client device

and an update time thereof;

an update information receiver for receiving the update information from the server device; and

an update controller for transmitting the updated
5 minimum element of the structured document to a client device having the update time of the structured document stored therein, which is later than the update time included in the update information received from the server device.

31. An information management method in a system
10 comprising a plurality of nodes connected to each other via a network, the method comprising the steps of:

at each of the plurality of nodes,

a) storing information to be shared among the plurality of nodes in a storage; and

15 b) managing an update of the information using an updated minimum unit of the information, the updated minimum unit including an updated portion of the information.

32. The information management method according to claim 31, wherein the step (b) comprises the steps of:

20 detecting that an update occurs at the node; and
transmitting an updated minimum unit of the information to another node.

33. The information management method according to

claim 31, wherein the step (b) comprises the steps of:

detecting that an update occurs at the node; and
transmitting update information to another node,
the update information including identification information
5 identifying an updated minimum unit of the information.

34. The information management method according to
claim 32, further comprising the steps of:

at a node receiving an updated minimum unit of the
information from another node,
10 c) updating a corresponding minimum unit of the
information stored in the storage using the updated minimum unit
received.

35. The information management method according to
claim 31, wherein the information comprises a plurality of
15 elements which are hierarchically structured, wherein a minimum
element including the updated portion of the information is
determined as the updated minimum unit.

36. The information management method according to
claim 31, wherein in the step (b), the update of the information
20 is managed using an update time at which the update of the
information occurs,

wherein the step (b) comprises the steps of:

detecting that an update occurs at the node; and

transmitting update information to another node,
the update information including the update time.

37. The information management method according to
claim 36, further comprising the step of:

5 at a node receiving the update information from
another node,

 c) updating the information stored in the storage
based on the update information received.

38. The information management method according to
10 claim 37, wherein the step (c) comprises the steps of:

 determining whether the update time of the update
information received is later than an updated time of the
information currently stored in the storage; and

 when the update time of the update information
15 received is later than an updated time of the information
currently stored in the storage, requesting transfer of an
updated minimum unit of the information.

39. The information management method according to
claim 31, wherein, when an update occurs at the node, an updated
20 minimum unit of the information is transmitted to another node
at a plurality of predetermined times.

40. The information management method according to

claim 31, wherein, when an update occurs at the node, update information is transmitted to another node at a plurality of predetermined times, the update information including identification information identifying an updated minimum unit
5 of the information.

41. The information management method according to claim 40, wherein the update of the information is managed using an update time at which the update of the information occurs, the update information further includes the update time.

10 42. The information management method according to claim 33, wherein the system further comprises a control node for controlling communications between the nodes on the network, the method further comprising the steps of:
at the control node,
15 c) managing the information stored in the storage for each of the nodes;
d) receiving an update information from a first node at which an update of the information occurs; and
e) transmitting the update information received
20 from the first node to a second node.

43. The information management method according to claim 42, wherein in the step (e), the update information received from the first node is transmitted to the second node at a plurality

of predetermined times.

44. The information management method according to claim 42, further comprising the steps of:

at the second node receiving the update information
5 from the control node,
updating the information stored in the storage based
on the update information received.

45. The information management method according to claim 44, further comprising the steps of:

10 at the second node,
determining whether the update time of the update
information received is later than an updated time of the
information currently stored in the storage; and
when the update time of the update information
15 received is later than an updated time of the information
currently stored in the storage, using the identification
information to request transfer of an updated minimum unit of
the information from the control node.

46. The information management method according to
20 claim 36, the system further comprises a control node for
controlling communications between the nodes on the network,
the method further comprising the steps of:
at the control node,

storing the information stored in the storage of each of the nodes in an information storage;

managing the information for each of the nodes and an update time thereof;

5 receiving an update information from a first node at which an update of the information occurs;

selecting a second node having the update time of the information stored therein, which is later than the update time included in the update information received from the first
10 node; and

transmitting the updated minimum unit of the information identified by the identification information included in the update information received from the first node, to the second node.

15 47. A structured document updating method in a network composed of a server device and a plurality of client devices, the server device storing a structured document composed of a plurality of elements which are hierarchically structured, each of the elements being a constituent unit of the structured
20 document, and each of the client devices storing a duplication of the structured document, the method comprising the steps of:

at the server device,

a) managing an update of the structured document using an updated minimum element of the structured document,
25 the updated minimum element including an updated portion of the

structured document; and

b) notifying the client devices on the network that the structured document is updated when a part of the structured document has been changed.

5 48. The structured document updating method according to claim 47, further comprising the steps of:

 at a client device receiving an updated minimum element of the structured document from the server device,

 c) updating a corresponding minimum element of the
10 structured document stored therein using the updated minimum element received.

 49. The structured document updating method according to claim 47, wherein in the step (a), the update of the information is managed using an update time at which the update of the
15 information occurs,

 wherein the step (b) comprises the step of:

 transmitting update information to the client devices, the update information including the update time.

 50. The structured document updating method according to claim 49, further comprising the step of:

 at a client device receiving the update information from the server device,

 c) updating the information stored therein based

on the update information received.

51. The structured document updating method according to claim 50, wherein the step (c) comprises the steps of:

5 determining whether the update time of the update information received is later than an updated time of the structured document currently stored therein; and

when the update time of the update information received is later than an updated time of the structured document currently stored therein, requesting transfer of an updated
10 minimum element of the structured document.

52. The structured document updating method according to claim 47, wherein an updated minimum unit of the structured document is transmitted to the client devices at a plurality of predetermined times.

15 53. The structured document updating method according to claim 47, wherein update information is transmitted to the client devices at a plurality of predetermined times, the update information including identification information identifying an updated minimum unit of the structured document.

20 54. The structured document updating method according to claim 53, wherein the update of the information is managed using an update time at which the update of the structured document

occurs, the update information further includes the update time.

55. The structured document updating method according to claim 47, wherein the network further comprises a gateway server device performing protocol processing between the server device and each of the client devices,

the method further comprising the steps of:

at the gateway server device,

c) managing the structured document stored in each of the client devices;

10 d) receiving an update information from the server device; and

e) transmitting the update information received from the server device to a client device.

56. The structured document updating method according to claim 55, wherein in the step (e), the update information received from the server device is transmitted to the client device at a plurality of predetermined times.

57. The structured document updating method according to claim 55, further comprising the steps of:

20 at the client device receiving the update information from the gateway server device,

updating the structured document stored therein based on the update information received.

58. The structured document updating system according to claim 57, further comprising the steps of:

at the client device,

determining whether the update time of the update

5 information received is later than an updated time of the structured document currently stored therein; and

when the update time of the update information received is later than an updated time of the structured document currently stored therein, using the identification information
10 to request transfer of an updated minimum unit of the structured document from the gateway server device.

59. The structured document updating system according to claim 47, wherein the network further comprises a gateway server device performing protocol processing between the server
15 device and each of the client devices,

the method further comprising the steps of:

at the gateway server device,

storing the structured document stored in each of the client devices in an information storage;

20 managing the structured document for each of the client devices and an update time thereof;

receiving an update information from the server device at which an update of the structured document occurs;

selecting a client device having the update time

of the structured document stored therein, which is later than the update time included in the update information received from the server device; and

transmitting the updated minimum unit of the
5 structured document identified by the identification information included in the update information received from the server device, to the selected client device.

60. A storage medium storing a computer program for performing information management in a system comprising a
10 plurality of nodes connected to each other via a network, the computer program at each of the plurality of nodes, comprising the steps of:

a) storing information to be shared among the plurality of nodes in a storage; and

15 b) managing an update of the information using an updated minimum unit of the information, the updated minimum unit including an updated portion of the information.

61. A storage medium storing a computer program for updating a structured document in a network composed of a server
20 device and a plurality of client devices, the server device storing a structured document composed of a plurality of elements which are hierarchically structured, each of the elements being a constituent unit of the structured document, and each of the client devices storing a duplication of the structured document,

the computer program at the server device, comprising the steps of:

a) managing an update of the structured document using an updated minimum element of the structured document,
5 the updated minimum element including an updated portion of the structured document; and

b) notifying the client devices on the network that the structured document is updated when a part of the structured document has been changed.